EFFECTIVENESS OF 2% CHLORHEXIDINE WITH TRANSPARENT POLYURETHANE (TEGADERM) DRESSING ON PREVENTING INFECTION AND COST EFFECTIVENESS AMONG PATIENT WITH CENTRAL VENOUS CATHETER

A DISSERTATION SUBMITTED TO THE TAMILNADU DR.M.G.R. MEDICALUNIVERSITY, CHENNAI, IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF SCIENCE IN NURSING

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CERTIFICATE

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"Oh, give thanks to the 'lord', for he is good!

For his mercy endures forever"

(Psalms – 136:7)

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ABSTRACT

This study intended to assess the effectiveness of chlorhexidine 2% with transparent polyurethane (tegaderm) dressing on preventing infection and cost effectiveness among patient with central venous catheter from selected hospitals in Madurai. An experimental approach was used for this study. The design adopted for the study was Quasi Experimental post test only design. Purposive sampling technique was adopted for this study .The sample consisted of 60 patients, in that 30 were in Experimental group and 30 were in Control group. The experimental group was treated with 2% chlorhexidine with transparent polyurethane (tegaderm) dressing and the control group was treated with routine betadine dressing. Dressing was done once in a day for both the groups. The tool used for data collection procedure was MR VICTOR Tool for assessment of central venous catheter site infection. Both descriptive and inferential statistics were used for the analysis of data. The major findings were, Moderate infection rate was found in experimental group was 1(3.3%) on 3rd day, whereas in control group 6(20%) had moderate infection. On the 6th day assessment showed only least 3 (10%) had moderate infection in experimental group, where as 10 (33.3%) had moderate infection in control group. The mean post test central venous catheter site infection score of experimental group for 6 days (0.56) was lower than the mean post central venous catheter site infection score of control group (0.73). The obtainer's' value of (2.86) in experimental group was lower than the obtained't' value of control group (3.91), which was significant at 0.05 levels. The 2% chlorhexidine with transparent polyurethane (tegaderm) dressing found to be effective in reducing the central venous catheter site infection when compared to betadine gauze dressing. Transparent dressing (Rs.129.50/day) was costly when compared to betadine gauze dressing (Rs.80.50/day).

CHAPTER – I

INTRODUCTION

BACKGROUND OF THE STUDY

"A life isn't significant except for its impact on other lives"

Central venous catheters are commonly used modality in the Medical Intensive Care Unit (MICU), Intensive Respiratory Care Unit (IRCU), Cardiac Care Unit (CCU) and Cardio Thoracic Intensive Unit (CTCU), serving a vital role in the management of critically ill patients. These devices involve placement of a large – bore catheter into one of the body's main central vein. [Vanderbilt Medical Centre, 2008]

Patients who had a CVC on admission or inserted during their stay on the general medical service in a public teaching hospital, November 15, 2004, to March 31, 2005.They identified 106 CVCs, 52 were present on admission and 54 were inserted; there were 682 catheter-days. The primary bloodstream infection rate was 4.4 per 1000 catheter-days (95% CI: 0.9-13): highest for catheters inserted in the emergency department compared with those inserted on other units (24 vs. 1.7 per 1000 catheter-days), p=0.45. (Trick et al., 2006)

Insertion of a central venous catheter (CVC) is a common procedure; the prevalence is about 6% of the hospitalized population. However, each catheter placed into a central vein may induce some morbidity and complications .The complications are mainly mechanical, thrombotic and infections. Catheter-related bloodstream infection is perhaps the most important complication. Catheter-related bloodstream infection is the second most important cause of nosocomial infection in the intensive

care unit (ICU) and considerably increases costs of hospitalization. Up to 90% of catheter-related bloodstream infections originate from CVCs. Bacteremia occurred in 5% of patients with ≥48 hours. (M.Zurcher, Tramer and Walder 2004)

Patients with catheter-associated bloodstream infection had significantly longer in ICU and hospital lengths of stay, with higher unadjusted total mortality rate and hospital cost compared with uninfected patients. (Warren et al., 2006)

Central venous catheters (CVCs) are increasingly used in the inpatient and outpatient setting to provide long-term venous access. The most common complications of CVCs are infection, suppurative, thrombophlebitis, and mechanical complications such as thrombosis. Infection of CVCs is a particularly common form of nosocomial infection. It is estimated, for example, that approximately 90 percent of the 50,000 to 100,000 annual catheter-related bloodstream infections in the United States occur with Central Venous Catheters. (Jeffrey D Band 2009).

Central venous cannulation has become a standard procedure since introduced to medical practice in the 1950s. 80 % of hospitalized patients receive a central venous catheter and more than five million central venous catheters are inserted in the United States each year. (Alan C and Heffner, 2007)

Most of the studies have demonstrated a higher rate of colonization under transparent dressing than under gauze. The higher rate of colonization observed with transparent dressing has not been consistently associated with a higher infection rate. Colonization is an important determinant of CVC related infection. “Breathable” transparent dressings reduce the growth of microorganisms. Use of topical antimicrobial agents has not been consistently demonstrated to reduce the rate of infection.

(Jones 2007)

Lucet et al., (2010) stated that scheduled replacement of central venous catheters and by extension of arterial catheters is not recommended because the daily risk of catheter related infection is considered constant over time after the first catheter days. Arterial catheters are considered at lower risk of catheter related infection than central venous catheters.

Bobo and Dubberke (2010) stated that intensivisits should be aware that epidemiology, risks and prevention measures may differ between the micro-organisms. In addition intensivisits should be ready to implement systems changes related to notification, isolation precautions and prevention and environmental cleaning in the intensive care unit.

Hospital acquired infections have profound social, economic and personal costs to patients in the intensive care unit (ICU). Numerous risk factors, such as poor nutrition and hyperglycemias, directly involve patients. Meanwhile, hand hygiene, environmental cleaning and appropriate hospital staffing can impact ICU infection rate (Barsanti 2009)

No studies have demonstrated any reduction in CVC infection rates with oral or parenteral antibacterial or antifungal drugs given during catheter insertion. In contrast numerous studies have reported that antibiotic administration in patients with a CVC in situ significantly reduced the risk of catheter colonization and blood stream infections. (Frasca , Dahyot –Fizelier and Mimoz 2010)

Compared with simple gauze dressings, transparent semi permeable dressings are more expensive but permit easy inspection of the site, stabilize the catheter, may offer an advantage to patients who are mobile, and have been left in place for up to 7 days. (Brenda crispell 2003)

Tegaderm — Film has a ""frame"" and "first aid" delivery system that makes placement quick and easy. Breathable film provides a bacterial and viral barrier to outside contaminants. It offers two, unique, different transparent adhesive dressing systems, giving the clinician a choice for patients with sensitive skin or a need for increased holding power in the presence of moisture .(Jones –Walton 2010)

Several studies have found increased bacterial colonization in warm, moist, occluded sites under transparent semi permeable (both conventional and the newer, highly permeable) dressings. (Davison 2002)

There are increasing numbers of patients, both at home and in the hospital, receiving intravenous therapy via long-term central venous catheters. Although fairly commonplace, there are many potential complications associated with the insertion and use of these catheters. They have recommended the nurse to have more information and confidence required for observing, detecting, preventing and or treating promptly any complication to ensure the best possible nursing care. (Sarah Drewett 2000)

Central venous catheters are integral to the care of acutely ill patients, providing reliable vascular access for infusions, hemodynamic monitoring, and blood sampling. However, there are risks associated with their use, the most common of which is central line-associated blood stream infections. These infections result in increased lengths of stay, increased costs, and high mortality rates. (Suzan, Miller-Hoover, Leigh Small 2005)

Central venous catheter is inserted with the tip resting in the distal end of the superior vena cava or the right atrium of the heart. Care requirements include cap change, cleansing, heparin flush and dressing change. (Lewis 2007)

Agarwal (2001) reported that strict adherence to hand washing and aseptic technique remains the corner stone of prevention of catheter related infection. However,

other measures may confer additional protection and must be considered when formulating preventive strategies .These measures include the selection of an appropriate site of catheter insertion and type of catheter material, use of barrier precautions during catheter insertion, use of transparent dressings, and replacement of catheters, administration sets and intravenous fluids at appropriate intervals.

Roberta Kaplow Sony R.Hardin (2009) reported that patients are at high risk for Hospital Acquired Infection; particularly when they are in the Intensive Care Unit. ICU infections with resistant pathogens increase both morbidity and mortality rates. Prevention strategies focus on the use of protective measures and early identification of Hospital Acquired Infections. To protect their patients, critical care nurses must be aware of all policies and procedure that reinforce aseptic patient care technique. Familiarity with high risk procedures and infection control prevention strategies.

SIGNIFICANCE AND NEED FOR THE STUDY

"Any profession which doesn't monitor itself becomes a technology"

-Marie Phancuf

Catheter-associated bloodstream infections remain an important cause of nosocomial infection, with an estimated 50,000–100,000 cases occurring each year in the United States. Central venous catheters are believed to be responsible for 90% of such infections. The cumulative risk of acquiring a catheter-related bloodstream infection has ranged between 1 to 10% for central venous catheters in general and 6% for total parenteral nutrition catheters. The skin is the most common source of organisms causing catheter-related infections. (Karim, Adal and Barry Farr 2008)

The indication for the use of central line include monitoring of the central venous pressure(CVP) in acutely ill patients to quantify fluid balance, long term intravenous antibiotics, long term parenteral nutrition especially in chronically ill patients, long term pain medications, chemotherapy, drugs that are prone to cause phlebitis in peripheral veins, frequent blood draws. (Ronark.I.Kuna 2008)

Central venous catheter line is needed for patients receiving chemotherapy over a long period of time, candidate for a blood or bone marrow transplantation. These catheters stay in place for long period of time and allow health care providers to give medications and blood products and take blood samples without having repeatedly poked the vein. (Karen Raymaakers 2010)

Jeffery Band (2009) has explained that Central venous catheter line is to be cared under strict adherence to hand washing and aseptic technique to reduce central venous catheter related infection Aqueous chlorhexidine appears more pronounced effect as demonstrated in a trial which randomized 662 central venous catheter or arterial catheter insertion to disinfection of the site prior to insertion and to subsequent site care with 10% povidine iodine, 70% alcohol, 2% chlorhexidine. Chlorhexidine was associated with a lower of both catheter related infection (2.3 vs. 9.3 and 7.1 per 100 catheters) and catheter related bacteraemia (0.5 vs. 2.3 and 2.6 per 100 catheters).

Catheter related infection rate is high in Intensive care unit. Approximately 48% of all Intensive care unit patients have central venous catheters at some point during their hospital stay. Central venous catheters disrupt the integrity of the skin, leading to a portal for pathogen entry and subsequent central venous catheter related blood stream infection. Approximately 90% of catheter related blood stream infections occur with central venous catheters. Mortality attribute to central venous catheter related blood

stream infection is between 4% to 20%. An estimated 500 to 4,000 U.S patients die annually due to blood stream infection. (Tom.R.Talbot, 2007)

Safdar and Klunger (2002) conducted prospective study in Madison on strategies for preventing central venous catheter related blood stream infections. Risk factors was associated with inexperience of the operator and nurse to patient ratio in the Intensive Care Unit, catheter insertion with less than maximal sterile barriers, placement of central venous catheter in the internal jugular or femoral vein rather than subclavian vein, contamination of the catheter and duration of central venous catheter placement > 7 days.

Krein et al., (2007) conducted a survey in non federal hospitals in US. Findings revealed that most US hospitals are using maximal sterile barrier precaution and chlorhexidine gluconate, and it was the most strongly recommended practices to prevent Catheter Related –Blood Stream Infections (CR-BSIs).

Catheter care protocols programs that help health care providers to monitor and evaluate care are crucial for the success of preventive measures. Educational programs with hygiene training and protocols concerning the preparation of the equipment, skin antiseptics, detailed insertion techniques, catheter manipulation (e.g.) Hand hygiene and catheter care are effective when staff members are involved in designing the measures included in the program. Educating and training of health care providers who insert and maintain central venous catheters is essential for preventing catheter related infection, improving patient outcomes, and reducing health care costs. (Farah erach 2005).

The use of central venous catheters (CVCs) for vascular access is now common place in a variety of care settings. Technological advances related to CVCs have introduced a multitude of catheter designs that are available to us through numerous manufacturers. To initiate the appropriate procedures for care, nurses involved in the

maintenance of central venous access devices. And they are now challenged with having familiar with a large variety of central venous access devices. It must be able to evaluate a CVC and determine its type, size, manufacturer, and specific characteristics as well as to initiate the appropriate management strategies related to that device. They must also be able to recognize the indications, advantages and disadvantages associated with each device, and to assist the patient in making an informed decision regarding the appropriate device for his or her therapy needs. It is essential that care and maintenance procedures should be delivered by those who have knowledge base and experience make them competent care providers with the expertise to initiate appropriate prevention and troubleshooting measures, as well as to evaluate and implement nursing actions related to complication (Baranowski 2004)

Infections can be decreased with strict sterile technique when changing dressings, and monitoring the patient closely for any signs of infection, including fever, redness or soreness at the site of insertion, and drainage from the insertion site. (Lewis 2007)

Catheter-related bloodstream infection remains the most serious complication of central venous access and a leading cause of nosocomial infection in the ICU. Prevention of catheter-related infection involves several measures which should be used in combination. The most important include the use of a checklist to guide catheter insertion and maintenance; adequate training of the nursing staff involved in the management of vascular access and an adequate patient-to-nurse ratio; the use of maximal sterile barrier precautions during catheter insertion; preference for a chlorhexidine-based solution for skin antisepsis and use of the subclavian vein whenever possible; cleaning hands with an alcohol-based hand rub solution before any manipulation of the infusion line; and removing any useless catheter. As with any

device used in the ICU, healthcare workers caring for a patient with a central venous access device need to be adequately trained, and assessed as being competent in using CVCs and adhering to infection prevention practice. (Julie Santy 2006)

The density of microorganisms at the catheter insertion site is a major risk factor for catheter-related infection. And skin antisepsis is one of the most important preventive measures. Povidone iodine and chlorhexidine are the most commonly used antiseptic agents; Both are available as aqueous and alcoholic solutions. Their respective efficacy in preventing catheter colonization and bloodstream infections has been compared in numerous studies. (Frasca, Dahyot –Fizelier and Mimoz 2010)

In a meta-analysis, the use of a chlorhexidine-impregnated sponge placed over the site of short-term vascular and epidural catheters significantly reduced the risk of catheter colonization but not catheter-related bloodstream infection compared to standard dressing. (Frasca, Dahyot –Fizelier and Mimoz 2010)

Preventing central venous catheter infection in Intensive care unit is an important priority for nurses. Being nursing personnel, it is a need to find out the more effective protocol to reduce the number of central venous catheter infection cases. This motivated the researcher to do study on this topic .This study is undertaken to high lighten the effective dressing in prevention of central venous catheter infection.

STATEMENT OF THE PROBLEM:

A study to assess the effectiveness of chlorhexidine 2% with transparent polyurethane (tegaderm) dressing on preventing infection and cost effectiveness among patient with central venous catheter in selected Hospital at Madurai.

OBJECTIVES:

1. To find out the level of infection among patients with CVC after application of chlorhexidine 2% with transparent polyurethane (Tegaderm) and routine dressing on 3rd and 6th day.
2. To evaluate the effectiveness of 2% chlorhexidine with transparent polyurethane (Tegaderm) application in preventing infection among patient with CVC in the experimental group on 3rd and 6th day.
3. To evaluate the effectiveness of routine dressing in preventing infection among patients with CVC in the control group on 3rd and 6th day.
4. To compare the post infection rate among CVC patient on experimental group with control group in 3rd and 6th day.
5. To compare the cost effectiveness of transparent polyurethane dressing (Tegaderm) with routine dressing among patient with CVC.

HYPOTHESES:

All the hypotheses were tested at 0.05 level of significance.

H1: There will be significant difference between the CVC site infection score on the 3rd and 6th day of the experimental group.

H2: There will be significant difference between the CVC site infection score on 3rd and 6th day of the control group.

H3: The mean post infection score of patient with CVC who had of transport polyurethane (Tegaderm) dressing will be significantly lower than the mean infection score of patient with CVC who had routine dressing on 3rd & 6th day.

H4: There will be significant difference in terms of cost who has received Tegaderm with routine treatment over the CVC site.

OPERATIONAL DEFINITIONS:

Effectiveness:

It means that in a way which produces the intended result (or) a successful result.

In this study, it refers to the outcome for transparent polyurethane (tegaderm) dressing and Betadine gauze dressing in preventing infection among the patient with central venous catheter which was assessed through MR VICTOR Tool (Multi Racial visual Inspection catheter tool observation Record) and if there is any excessive discharge at central venous catheter site culture results was taken. MR VICTOR tool of central venous catheter site is attached in Appendices IV in page number- 73.

Chlorhexidine 2%:

It is a powerful, non-irritating antiseptic that disrupts bacterial cell membrane. In this study 2% chlorhexidine was used to clean the central venous catheter site once in a day.

Transparent Polyurethane dressing (Tegaderm):

Transparent polyurethane dressing was used to protect the catheter site from external contamination, to secure the central venous catheter and to discourage bacterial proliferation near the insertion site. In present study it refers to the dressing used at the CVC line, which will be changed every 24 hours for 7 days. In this study, subjects who received transparent polyurethane (tegaderm) dressing at central venous catheter site were included in the experimental group.

Betadine Gauze Dressing:

It is a microbial agent, which helps in preventing infection. It refers to cleaning the central venous Catheter with 5% of betadine solution followed by an application of gauze soaked in betadine solution over the Central venous catheter site. Dressing was

applied to the Central Venous Catheter site once in a day. In this study subjects who received betadine gauze dressing at central venous catheter site were included in routine treatment (control group).

Infection:

It is the invasion of the body by microorganisms that reproduce and multiply causing disease.

It refers to the entering of micro-organism to the central venous catheter site which was assessed by the use of MR VICTOR Tool and culture results.

Cost Effectiveness:

It is defined as producing useful results in relation to its cost.

It refers to the comparison between of the amount spend for transparent polyurethane (Tegaderm) dressing with betadine gauze dressing change at the central venous catheter site.

Central Venous catheter:

It is a catheter placed into a large vein in the neck (or) thigh. It is used to administer medication or fluids obtain blood tests and directly obtain cardiovascular measurements.

In this study, patients who had central venous catheter used to administer medication and fluids were selected.

ASSUMPTIONS:

1. Central venous catheter infection rate can be detected by frequent observation.
2. Nurses have got an important role in providing central venous catheter care.
3. Nurses have got responsibility in providing cost effective care to the patients.

DELIMITATION:

The study is delimited to

a. Both adult male and female patients with central venous catheter at Jugular vein and subclavian vein

b. Patients who are admitted in the selected hospital during the period of Data collection

c. The data collection period is limited to 6 weeks.

d. Patients who had transparent polyurethane dressing or betadine gauze dressing over the central venous catheter site for 7 days.

PROJECTED OUTCOMES:

The study will be useful for the nurses to enlighten their knowledge regarding central venous catheter care and observation. By that it helps prevention of central venous catheter site infection among patients who are in central venous catheter.

CONCEPTUAL FRAME WORK:

The study was based upon J.W.Kenny's open system model. All living systems are open in that there is a continual exchange of matter, energy and information .Open systems have varying degrees of interaction with the environment from which the system receives input and gives back output in form of matter, energy information. For survival, all systems must receive varying types and amount of matter, energy and information.

The main concepts of the system model are Input, Throughput and Output and Feedback.

INPUT:

In this open system theory, Input refers to the matter, energy and information that enters into the system through its boundary. In this study it refers to application of 2%

chlorhexidine with transparent polyurethane (tegaderm) for experimental group and routine betadine gauze dressing for control group.

THROUGHPUT:

In this open system theory, throughput refers to processing where the system transforms the matter, energy and information. In this study it refers to protect the central venous catheter from external contamination in experimental group and in control group by microbial agent which helps in preventing infection at central venous catheter site.

OUTPUT:

In this open system theory, output refers to the matter, energy and information that are processed. After processing the input, the system returns output (matter, energy and information) to environmental in an altered state .In this study it refers to the samples in experimental group was treated 2% chlorhexidine with transparent polyurethane (tegaderm) reduce the catheter related infection and routine betadine gauze dressing has only mild effect on prevention of catheter related infection .

FEEDBACK:

In this open system theory, feedback refers to environmental response to the system's output used by the system adjustment, correction and accommodation to the interaction with environment. In this study it refers on the analysis of post test infection assessment of central venous catheter site on care of patients. If severe infection occurs culture can be taken and the same pattern can be followed once again.

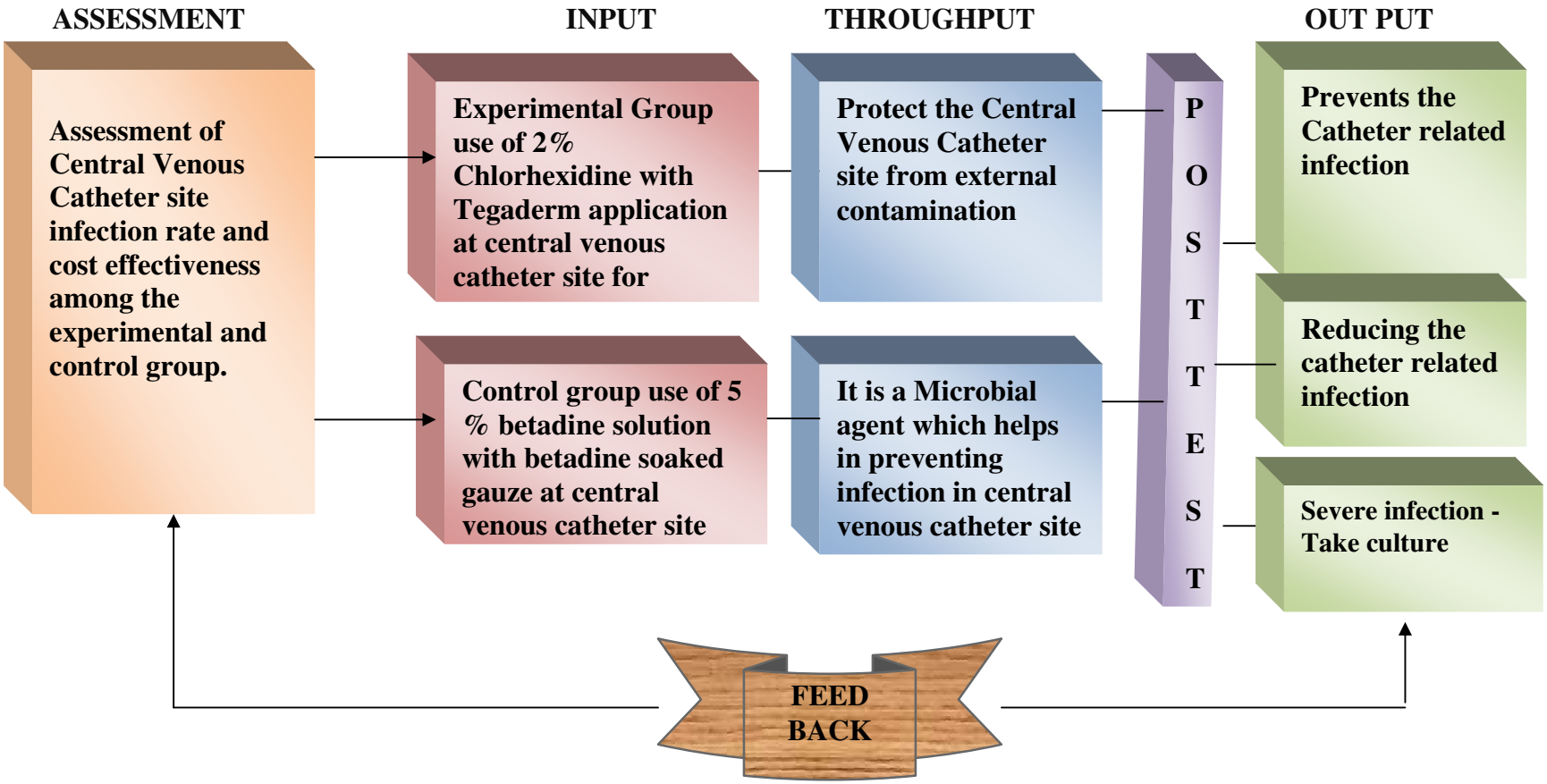

Figure 1: CONCEPTUAL FRAME WORK BASED ON

J.W. Kenny's Open System Model

CHAPTER II

REVIEW OF LITERATURE

The primary purpose of reviewing relevant literature is to give a broad background knowledge (or) understanding of the information that is available related to the research problem of interest .(Burns-2001)

This chapter consists of,

1. Literature related to common types and uses of central venous catheter
2. Literature related to central venous catheter infection
3. Literature related to role of chlorhexidine in reducing infection at central Venous catheter site
4. Literature related to role of betadine in reducing infection at central venous Catheter site
5. Literature related to cost effectiveness

Literature related to common types and uses of central venous catheter

Paul L.Marino (2006) stated that the types of central venous catheter are single, double and triple lumen, peripherally inserted central catheter, implanted central line, percutaneously inserted central venous catheters.

Jeffrey D Band (2010) explained percutaneously inserted central venous catheters are the most commonly used central catheters .Most central venous catheters are inserted centrally into the subclavian, jugular and femoral veins. However, peripherally inserted central catheters (PICCs) continue to gain in popularity because of the following advantages: The relative ease of insertion into the cephalic or basilar vein of the anticubital fossa; a low risk of complications good patient tolerance.

(Frasca, Dahyot, Fizelier and Mimoz 2010) conducted a Comparative study to assess the mono-lumen catheters and the use of multiple lumen catheters on catheter colonization and Blood Stream Infection. The findings revealed that when compared to mono-lumen catheters, the use of multi -lumen catheters was associated with comparable risks of catheter colonization (RR: 0.80 [95% CI: 0.43-1.50]), but higher risks of bloodstream infection (RR: 2.26 [95% CI: 1.06-4.83]). The increased risk of bloodstream infection is explained by one study which included long-term catheters (mean duration of catheterization longer than 20 days) for parenteral nutrition and reported a surprisingly high level of infection with multiple lumen catheters (13.1%) versus (2.6%) with mono-lumen catheters).

Literature related to central venous catheter infection

Frasca and Dahyot-Fizelier (2010) conducted five randomized studies among 617 Intensive Care Unit (ICU) patients at France .This study is based on the prevention of central venous catheter related infection in the Intensive Care Unit (ICU), evaluated the performance of a catheter coated on its extra luminal site with chlorhexidine were included in a meta-analysis. Compared to a standard catheter, the use of the coated catheter decreased the risk of catheter colonization (relative risk, RR: 0.59 [95% CI: 0.50-0.71]) and bloodstream infection (RR: 0.66 [95% CI: 0.47-0.93]). There is no evidence for multi-resistant bacteria on selection with antibiotic-coated catheters. The use of CVCs coated with antimicrobial agents should be reserved for ICUs where, the incidence of catheter-related infection is more.

Allan D (2008) Conducted a meta-analysis of three prospective non-randomized studies compared catheters inserted in the internal jugular (n = 278) and subclavian (n = 429) veins. The use of the internal jugular vein was associated with a

non-significant increase in the risk of bloodstream infection (RR: 2.24 [95% CI: 0.2-22.1]) compared to the subclavian route. Moreover, multivariate analysis of several prospective studies has shown more frequent infectious complications when using femoral or internal jugular access.

Pearson (2002) done a randomized multicenter study evaluated the risk of complications with dialysis catheters in the ICU according to femoral or internal jugular insertion site. A total of 750 catheters with an average duration of insertion of 6 days were included. The risk for colonization was comparable for both sites (incidence of 40.8 vs. 35.7 per 1000 catheter-days for the femoral and jugular sites, respectively, RR: 0.85 [95% CI: 0.62-1.16]). Nevertheless, the risk of colonization with internal jugular access was increased in patients with a body mass index less than 24.2 (RR: 2.10 [95% CI: 0.23-0.69]) and decreased in patients with a body mass index greater than 28.4 (RR: 0.40 [95% CI: 1.13-3.91])

Victor Daniel Rosenthal et al., (2003) conducted a prospective study about nosocomial infection in medical surgical intensive care unit in Argentina about 2 months surveillance. The most common site of infection was catheter related blood stream infection 32% .The rate of central venous associated with blood stream infection in medical surgical intensive care unit was 44.6 per 1000 days with an attributable mortality of 25% and excess hospital stay.

Literature related to role of chlorhexidine in reducing infection at central venous catheter site

Heiner Ruschulte et al., (2008) conducted a randomized, prospective, open, controlled clinical study among 601 patients in university hospital about Prevention of central venous catheter related infections with chlorhexidine gluconate impregnated wound dressings for cancer patients received chemotherapy. Daily routine

included clinical assessment of the insertion site (swelling, pain and redness), temperature, white blood count and C-reactive protein had been done. The incidence of CVC-related infections were 11.3% (34 of 301) and 6.3% (19 of 300) in the control and Chlorhexidine-impregnated wound dressing groups, respectively (p=0.016, relative risk 0.54; confidence interval 0.31–0.94). Especially, catheter-related infections at internal jugular vein insertions could be reduced (p=0.018). The use of chlorhexidine-impregnated wound dressings significantly reduced the incidence of CVC-related infections in patients receiving chemotherapy.

David and Veenstra (2007) did a randomized trials comparing chlorhexidine–silver sulfadiazine–impregnated central venous catheters with no impregnated catheters were included. Twelve studies met the inclusion criteria for catheter colonization and included a total of 2611 catheters. Most patients in these studies were from groups considered to be at high risk for catheter-related infections The ratio for catheter colonization was 0.44 (95% confidence interval [CI], 0.36-0.54; *P*<.001), indicating a significant decrease in catheter colonization associated with impregnated catheters. This study concluded that central venous catheters impregnated with a combination of chlorhexidine and silver sulfadiazine appear to be effective in reducing the incidence of both catheter colonization and catheter-related bloodstream infection in patients at high risk for catheter-related infections.

Gilles and Riordan L (2002) have done a randomized controlled trials evaluating the effects of dressing type (i.e. gauze and tape and/or transparent polyurethane dressings) on central venous catheter sites in Australia. Of the 23 studies reviewed, 14 were excluded. Nine studies were included. Data was only available for meta-analysis from six of the nine included studies .The conclusion of the study was there was a high level of uncertainty regarding the risk of infection with the central

venous catheter dressings identified in this review. Therefore, at this stage it appears that the choice of dressing for central venous catheters can be based on patient preference to identify the most appropriate central venous catheter dressings.

Lawson and Millie (2006) undertook a comparative study on transparent dressing to paper tape dressing over central venous catheter sites which were evaluated in 365 cancer patients with newly inserted central venous catheters and were they randomly assigned to one of two treatment groups. (1) Transparent dressing (tegaderm) changed twice in week n=188. (2) Paper tape dressings changed three times a week n=177.Patients is observed for signs of infection, phlebitis and dressing adherence. Transparent polyurethane dressings worn up to 7 days were equivalent to paper tape dressing worn for shorter periods with respect to incidence of phlebitis and infection, however maintenance cost can be reduced.

Madeo et al., (1998) conducted a randomized trial comparing Arglaes (transparent dressing containing silver ions) to tegaderm (a transparent polyurethane dressing) for dressing peripheral arterial catheters and central vascular catheters among 31 patients in UK admitted in ICU. Skin swabs were taken from the insertion site prior to catheterization and on removal of the intravascular device to measure skin colonization rates between the two dressings. The catheter tips were also cultured on removal to establish if there was a difference between the two groups .No statistical differences were found in bacterial growth between the two dressings.

Gilles D et al., (2009) conducted a study on gauze and transparent polyurethane and tape dressing for central venous catheters. Several different kinds of dressing were used for protecting the central venous catheter site. These may vary in their durability, ease of use, ability to prevent infection and skin reaction. However, the

review of trials found there was not enough evidence to determine any of the dressings for central venous catheters and they are better than any of the others.

Literature related to role of betadine in reducing infection at central venous catheter site

Frasca , Dahyot –Fizelier and Mimoz (2010) had done a Meta analysis study among 4143 short term catheters (1568 central venous catheters, 1361 peripheral venous catheters, 704 arterial catheters and 395 pulmonary artery catheters) in hospitalized patient**.** To compare chlorhexidine to a aqueous povidone iodine .The use of chlorhexidine catheters than povidone iodine aqueous solution significantly reduced catheter related blood infections by approximately 50 % [RR: 0.51 (95% CI, O.27 - 0.97)]. For every 1000 catheter sites disinfected with chlorhexidine solutions rather than povidone iodine solutions, 71 episodes of central venous catheter colonization and 11 episodes of infection would be prevented.

Chiayakunapruk ,Veenstra , Lipsky and Saint (2002) conducted a randomized clinical trials with outcomes defined that the relative risk of colonization and catheter related blood stream infection were significantly lower than with chlorhexidine compared to povidone iodine.

Literature related to cost effectiveness

David , Sanjay and Sullivan,(2005) conducted a case analysis, use of an antiseptic-impregnated catheter compared with a standard catheter resulted in an expected saving of costs of $196 per catheter .The expected incidence of CR-BSI decreased from 5.2% for standard catheters to 3.0% for antiseptic-impregnated catheters, an absolute decrease of 2.2% and relative decrease of 42%. The expected incidence of death attributable to the combination of CR-BSI and/or hypersensitivity

reaction decreased from 0.78% to 0.45%, an absolute decrease of 0.33% and a relative decrease of 42%. The incidence of local infections decreased from 12.4% to7.5%. The calculation of an incremental cost-effectiveness ratio (e.g., cost per death avoided) was not conducted because the intervention is dominant greater efficacy and lower costs.

J C Shivnan et al., (2009) done a randomized, prospective study to compare two types of catheter dressings in 98 patients undergoing Bone marrow transplantation (BMT): a dry sterile gauze dressing (DSGD) changed daily and a transparent adherent dressing (TAD changed every four days in Johns Hopkins Oncology Centre. Study outcomes included incidence and severity of local and systemic complications, patient assessment of comfort, and calculation of nursing time. One case of catheter-related infection occurred during the study. No significant differences existed between the two dressings in the incidence of positive skin cultures or local complications with the exception of skin irritation. The TAD which caused less skin irritation, was preferred by patients, cost less, and required less nursing time. The findings indicate that TADs provide a safe, comfortable, and cost-effectiveness for patients undergoing BMT and receiving antibiotic support during aplasia.

CHAPTER III

RESEARCH METHODOLOGY

The research methodology indicates the general pattern of organizing the Procedure of gathering valid and reliable data for an investigation. This chapter provides a brief description of the method adopted by the investigator in this study.

It includes the research approach, research design, the setting, the population, the sample and criteria for the sample selection. It further deals with the development of tool, pilot study and procedure for data collection and plan for data analysis

Research Approach:

An experimental approach was used for this study. This study was designed to assess the effectiveness of transparent polyurethane (tegaderm) and betadine dressing on preventing infection and cost effectiveness among patients with central venous catheter.

Research Design:

The quasi experimental post-test only design with experimental and control group was chosen for the study. Post –test only design is the design in which data on dependant variable are collected only once after the experimental treatment has been introduced (Polit, 2007)

The research design used in the study is diagrammatically represented below.

Group	**Manipulation of Independent variable**	**Measurement of dependent variables in days**
Experimental Group	T_1	O_3 O_6
Control Group	T_2	O_3 O_6

Key:

T_1 – Application of transparent polyurethane (tegaderm) dressing among patients with CVC in experimental group.

T_2– Application of routine betadine gauze dressing among patients with CVC in control group.

O_3 O_6 – Post assessment of the CVC site on 3rd and 6th day in both the groups.

Independent variable – Transparent polyurethane (tegaderm) and Betadine dressing.

Dependent variable - Infection at central venous catheter site.

SETTING OF THE STUDY

This study was conducted in the Apollo hospital and Shenbagum hospital Madurai.

Apollo hospital is ½ km away from Sacred Heart Nursing College. The hospital is a multi specialty hospital having 250 beds. There are 6o beds in Intensive Care Unit (ICU), Cardiac Care Unit (CCU) and nearly 20 patients are with central venous catheter per day.

Shenbagum hospital is 1 km away from the Sacred Heart Nursing College. The Hospital has a multi specialty facility with 125 beds. There are 10 beds in Intensive Care Unit (ICU) setting and nearly 4 -5 patients are admitted with central venous catheter per day.

STUDY POPULATION:

The populations of the study were patients with Central Venous Catheter admitted in Intensive Care Unit (ICU) of Apollo and Shenbagum hospital

SAMPLE:

Patient with central venous catheter both male and females who fits inclusion criteria were selected.

SAMPLE SIZE:

The sample size was 60 patients, out of which 30 patients were in the experimental group and 30 patients were in the control group.

SAMPLING TECHNIQUE:

Purposive sampling technique was used to select the sample .It's a type of non – probability sampling method in which the researcher selects participants for the study on the basis of personal judgment about which ones will be most representative also referred to as judgmental sampling (Polit 2007).

CRITERIA FOR SAMPLE SELECTION:

The sample was done based on the following inclusion and exclusion criteria.

INCLUSION CRITERIA:

1. Central Venous Catheter usage to administer I.V. fluids, medications, blood products and hemodynamic monitoring was included from Apollo and shenbagam hospital.
2. Patients with central venous catheter in site for 7 days.
3 Both male and female patients.
4. Patients with jugular and subclavian central venous catheter site.

EXCLUSION CRITERIA:

1. Patients with arterial, pulmonary catheters and femoral central venous catheter site.
2. Patients who have already developed infection at the site of CVC line.

3. Central venous catheter with administration of dialysis and total parenteral nutrition.

RESEARCH TOOL AND TECHNIQUE:

Tool - I:

This consists of demographic variables such as age, gender, marital status, site and types of Central Venous Catheter.

Tool - II:

This consists of MR VICTOR Tool (Multi Racial Visual Inspection Catheter Tool Observation Record) to assess the infection rate on central venous catheter line .Total questions were 5.The maximum score of questions were 10. The score ranges from 0 to 4.The tool describes about the scoring and signs and symptoms.

Score “o” indicates – No infection

Score 1 and 2 indicates – Mild infection

Score 3 indicates – moderate infection.

Score 4 indicates – severe infection.

No Infection:

No fever, No discharge, Dry & Clean wound.

Mild Infection:

Mild fever, Mild serum discharge.

Moderate Infection:

Fever, pus wound, serum discharge,

Severe Infection

Catheter blockage, catheter tip culture positive

MR VICTOR is a universal tool that is transferable to all clinical areas and suitable for primary and acute care. The tool is used to recognize early signs of infection, prevent complication and speed up the removal of central venous catheters. It is a unique visual tool for health care professionals, which had both pictures and a scoring system to assess the levels of infection for different skin colors. (Bethel 2005)

This scale is down loaded from internet and used as it is without doing any modification.

VALIDITY:

Testing of the tool

MR VICTOR Tool (Multi Racial Visual Inspection Catheter Tool Observation Record) was established by Dee Waterhouse and Jean Winter bottom (http:// www.ncbi.nlm.nih.gov/pubmed citated in the internet on Feb. 2010). In present study investigator checked the validity of the tool by submitting the tool to five experts in the field of medical and two experts in the field of nursing. Based on their suggestion tool was accepted as it is. No modification was done.

RELIABILITY:

Inter-rator reliability was used to establish the reliability of the tool. karl Pearson's co-efficient of co-relation was used (r =0.8).

DEVELOPMENT OF INTERVENTION

Definition:

In this study two types of dressing are used i.e. 2% chlorhexidine with transparent polyurethane (tegaderm) dressing and routine betadine gauze dressing.The transparent polyurethane dressing was used to protect the catheter site from external

contamination, to secure the central venous catheter and to discourage bacterial proliferation near the insertion site. It is a microbial agent, which helps in preventing infection. It refers to cleaning the central venous Catheter with 5% of betadine solution followed by an application of gauze soaked in betadine solution over the Central venous catheter site

Aim:

To prevent infection on central venous catheter site infection.

Steps in procedure:

- Establish and maintain a trust worthy relationship.
- Self introduction about the importance of dressing changes on central venous catheter site.
- Wear mask and wash hands thoroughly for 15 sec.
- Put on clean gloves and remove the old dressing on the CVC site.
- Inspect the area around the site for any signs of infection by using MR VICTOR TOOL.
- Open the sterile dressing tray
- Clean the area with 2% chlorhexidine for experimental group and use betadine solution for control group 30 seconds and allow dry for 30 sec.
- Apply transparent polyurethane (tegaderm) in experimental group and soaked betadine gauze in control group.
- Remove the gloves and discard it.
- Secure the dressing with adhesive tape in control group.
- Assessment done on 3^{rd} and 6^{th} day in experimental and control group by using MR VICTOR Tool.

PILOT STUDY:

In order to test the feasibility, relevance and practicability of the study was conducted among six patients with central venous catheter (among that 3 patients for experimental group , 3 patients for control group) in the same manner as that of the original study in private hospital at Madurai .Data were analyzed to find out the suitability of statistical method. It revealed that the study was feasible.

DATA COLLECTION PROCEDURES:

Before starting the study, the researcher obtained formal permission to conduct the study from the Apollo and Shenbagum hospital authority and the dissertation committee of Sacred Heart Nursing College .The period of study extended for 6 weeks. The researcher explained the objectives of the study to the physicians, surgeons and other nursing staff, patients before starting the data collection so, as to get co-operation in the procedure of data collection. The subjects were divided into experimental and control group. Initially the subjects were interviewed in order to collect demographic data.

In experimental group, the central venous catheter site was cleaned with 2% Chlorhexidine solution followed by transparent polyurethane (tegaderm) application once in a day continuously for seven days, on the 3^{rd} and 6^{th} day the post assessment of the infection rate was assessed by MR VICTOR Tool.

In control group , the central venous Catheter site was cleaned with 5% Betadine solution followed by betadine soaked gauze dressing application was done once a day continuously for 7 days. On the 3^{rd} and 6^{th} day the post assessment of infection rate was assessed by MR VICTOR Tool. For each sample approximately 30 minutes was spent. The investigator does not experienced problem in the data collection process.

DATA ANALYSIS:

After the data collection, data was tabulated, summarized and analyzed. The data was analyzed as follows:

Computation of frequencies, percentage for demographic data.

1. Paired 't' test of significance was used to find out the effectiveness of dressing used for experimental and control group.

2. Independent't' test of significance was to find out the post mean infection assessment score of dressing used for experimental and control group.

PROTECTION OF HUMAN RIGHTS:

The pilot study and the main study were conducted after the approval of the ethical committee of the Sacred Heart Nursing College. Permission was obtained from the chief surgeon and physician of the Shenbagum hospital and Apollo hospital, Madurai. Assurance was given to the subjects, that confidentiality would be maintained. Oral consent was obtained from the study subjects .The subjects were explained about any time they have got the rights to withdraw from the study. There was an absence of Physical and psychological strain to study subjects during the data collection procedure.

CHAPTER IV

DATA ANALYSIS AND INTERPRETATION

This chapter deals with the description of the sample analysis and interpretation of data to assess the effectiveness of 2 % chlorhexidine with transparent polyurethane (tegaderm) dressing on preventing infection and cost effectiveness among patient with central venous catheter .The obtained data was classified , grouped and analysed statistically based on the objectives of the study.

ORGANIZATION OF THE FINDINGS

SECTION I: Deals with frequency and percentage distribution of demographic characteristics of the samples

SECTIONII: Deals with frequency and percentage distribution of central venous catheter site infection among the experimental and control group.

SECTION III: Comparison of central venous catheter site infection Score of subjects.

a. Comparison of mean central venous catheter site infection Assessment score of the experimental group on 3rd and 6th day

b. Comparison of mean central venous catheter site infection score of the control group on 3rd and 6th day.

c. Comparison of mean central venous catheter infection score of Experimental and control group on 3rd day.

d. Comparison of mean central venous catheter infection score of Experimental and control group on 6th day.

e. Comparison of mean central venous catheter infection score of Experimental and control group

Section IV: Comparison of cost effectiveness of transparent polyurethane Dressing (tegaderm) and routine dressing among patient with Central venous catheter

SECTION -I

DEMOGRAPHIC PROFILE OF THE SAMPLE

Table 1

Distribution of sample according to demographic variables

N=60

Characteristics	Experimental Group (n=30)		Control Group (n=30)		Total	
	f	%	f	%	f	%
Age (in years)						
20 – 40	8	26.6	3	10	11	18.33
41 – 60	14	46.6	17	56.6	31	51.66
61 – 80	8	26.6	10	33.3	18	30
Sex						
Male	19	63.3	20	66.6	39	65
Female	11	36.6	10	33.3	21	35
Marital status						
Married	25	83.3	26	86.6	51	85
Unmarried	5	16.6	4	13.3	9	15

Characteristics	Experimental Group (n=30)		Control Group (n=30)		Total	
	f	%	f	%	f	%
Site of CVC line						
Internal jugular vein	27	90	29	96.6	56	93.33
Subclavian vein	3	10	1	3.3	4	6.66
Types of CVC						
Double lumen	4	13.3	3	10	7	11.66
Triple lumen	26	86.6	27	90	53	88.33

The data presented in table 1 shows that majority of clients 14 (46.6%) in the experimental group belongs to the age group of 41 – 60 years and where as 17 (56.6%). In the control group belong to the age group of 41– 60 years.

With regard to sex, in the experimental group 19 (63.3%) were males and in the control group 20(66.6%) were males.

Regarding marital status in the experimental group 25 (83.3%) were married and in the control group 26 (86.6%) were married

With regard to site of the central venous catheter line, majority of the subjects in the experimental group 27 (90%) and control group 29 (96.6%) had central venous catheter at internal jugular vein.

With regard to the type of central venous catheter, 26 (86.6%) of clients had triple lumen catheter in the experimental group and 27 (90%) had triple lumen catheter in control group.

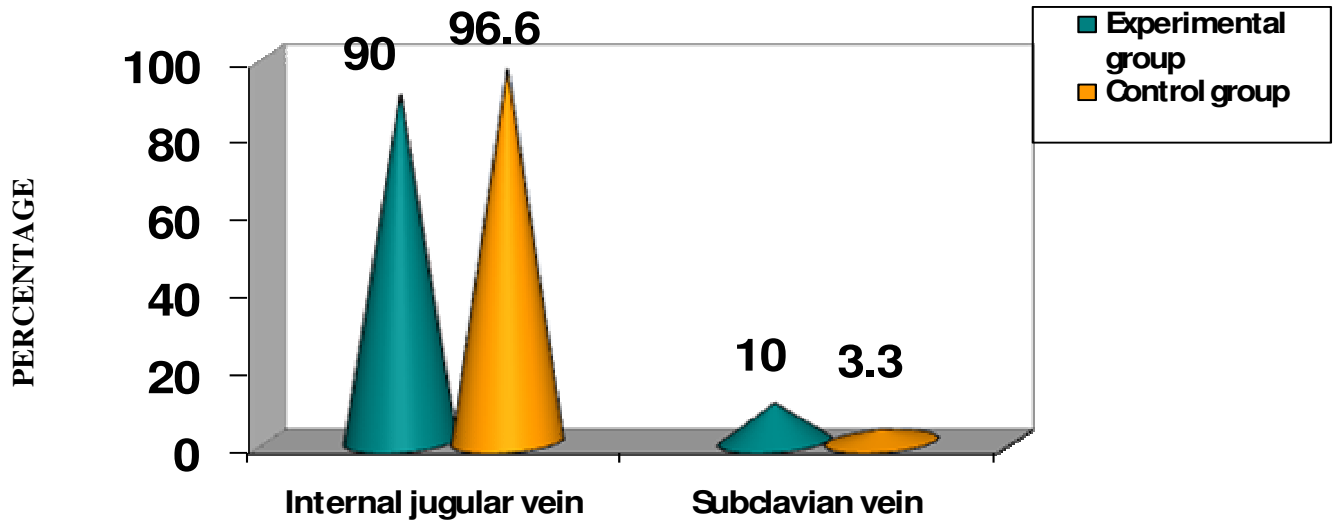

Figure 2:Distribution of Sample In terms of Site of Central Venous Catheter

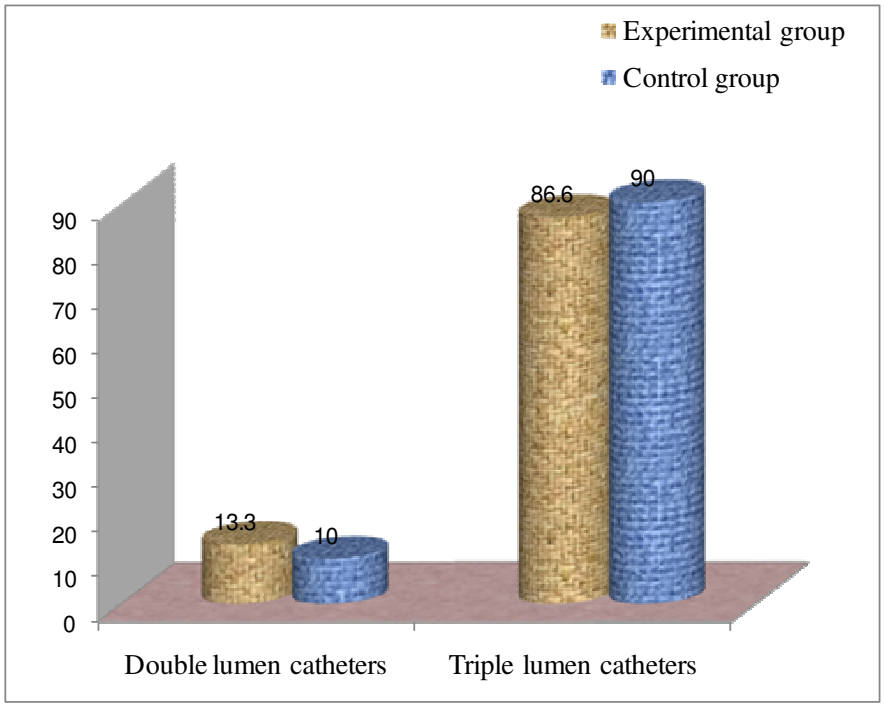

Figure 3: Distribution of Sample In terms of Types of Central Venous Catheter.

SECTION –II

TABLE 2

Deals with frequency and percentage distribution of central venous Catheter site infection among the experimental and control group

N = 60

Level of infection	experimental group n= 30				control group n=30			
	3rd day		6th day		3rd day		6th day	
	f	%	f	%	f	%	f	%
No infection	21	70	11	36.6	13	43.3	5	16.6
Mild infection	8	26.6	16	53.3	11	36.6	15	50
Moderate infection	1	3.3	3	10	6	20	10	33.3
Severe infection	-	-	-	-	-	-	-	-

Based on the level of infection obtained in the MR VICTOR tool. The subjects were classified into four groups, no infection (0), mild infection (1and 2), moderate infection (3), severe infection (4). A higher score indicates poor infection status where as

a low score indicates good reduction in infection rate.

Table 2 shows that in experimental group majority of the subjects 21(70%) had no infection on 3rd day where as in control group only 13 (43.3%) had no infection. with regard to on 6th day assessment, in experimental group 11 (36.6%) had no infection.

Related to mild infection rate at central venous catheter, in experimental group 8(26.6%) had mild infection on 3rd day and 11 (36.6%) had mild infection in control group. whereas after application interventions on 6th day 16 (53.3%) had mild infection in experimental group and 15 (50%) had mild infection in control group.

Moderate infection rate was found to be 1(3.3%) in experimental group on 3rd day, whereas control group had 6(20%). on the 6th day assessment should only least 3 (10%) had moderate infection in experimental group, where as 10 (33.3%) had moderate infection in control group. None of the subjects in both the groups had severe infection. This difference in experimental and control group may be due to the effect to transparent polyurethane (tegaderm) dressing.

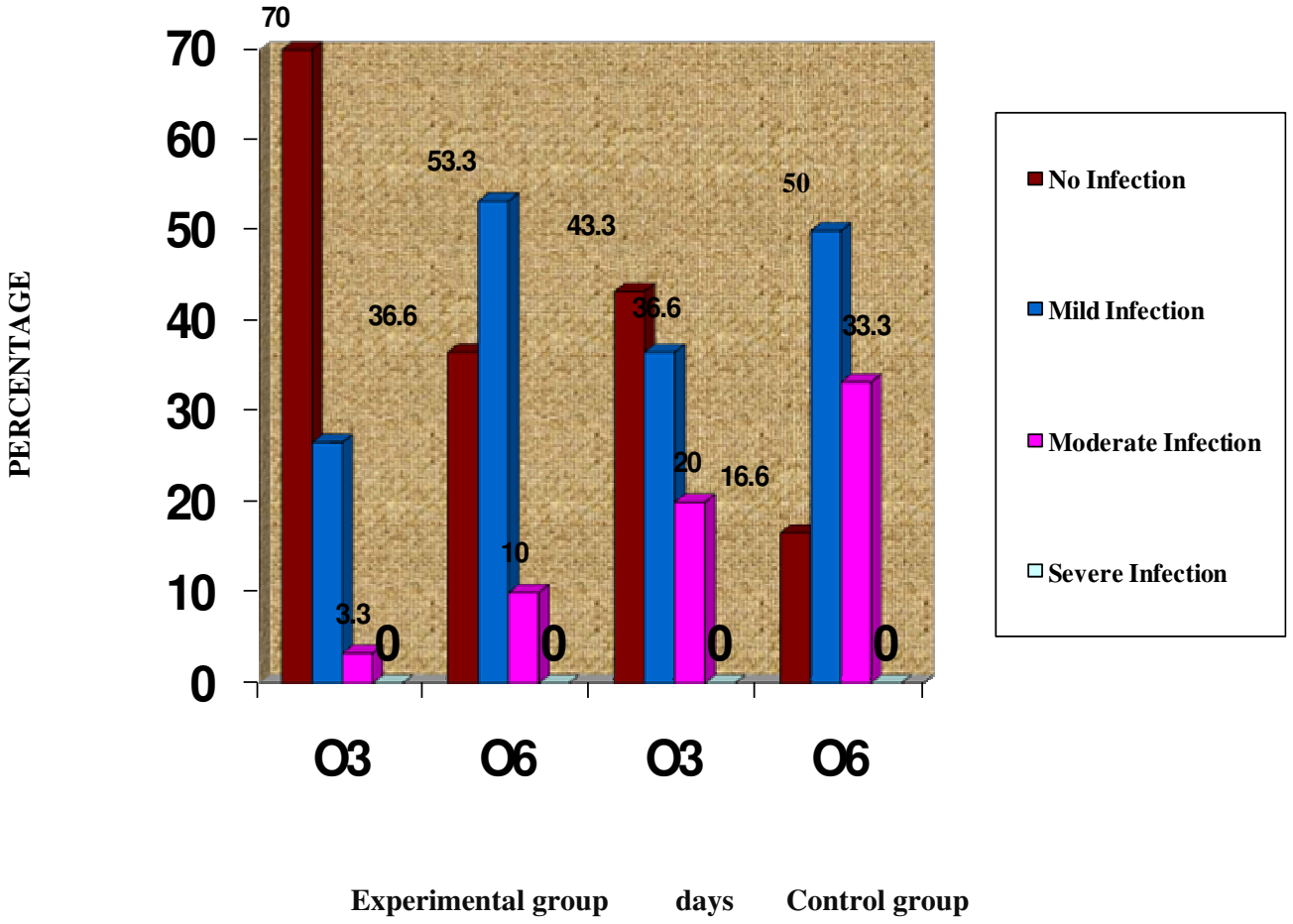

Figure 4: Distribution of central venous catheter site infection among the experimental and control group

SECTION - III

Table -3

Comparison of mean central venous catheter infection score of the experimental group on the 3rd and 6th day

N = 30

Level of infection	N	Mean	SD	't value'
3rd day	30	0.4	.70	2.83 *
6th day	30	0.9	.90	

*Significant at 0.05 level

In order to find out the difference of central venous catheter site infection assessment score between on the 3rd and 6th day of the experimental group, the null hypothesis was stated as follows:

Ho1 There will be no significant difference between the central venous catheter site infection assessment score on 3rd and 6th day of the experimental group.

Table 3 shows that the mean central venous catheter site infection assessment score on the 3rd day (o.4) is lower than the central venous catheter site infection assessment score on the 6th day (0.9) .The obtained 't' value of 2.83 at degree of freedom 29 was significant at 0.05 level. This indicates that the difference between the mean 0.5 was the true difference and has not occurred by chance. So the researcher rejected the null hypothesis and accepted the research hypothesis.

The findings revealed that central venous catheter infection was less on the 3rd day than on the 6th day among the subjects in the experimental group.

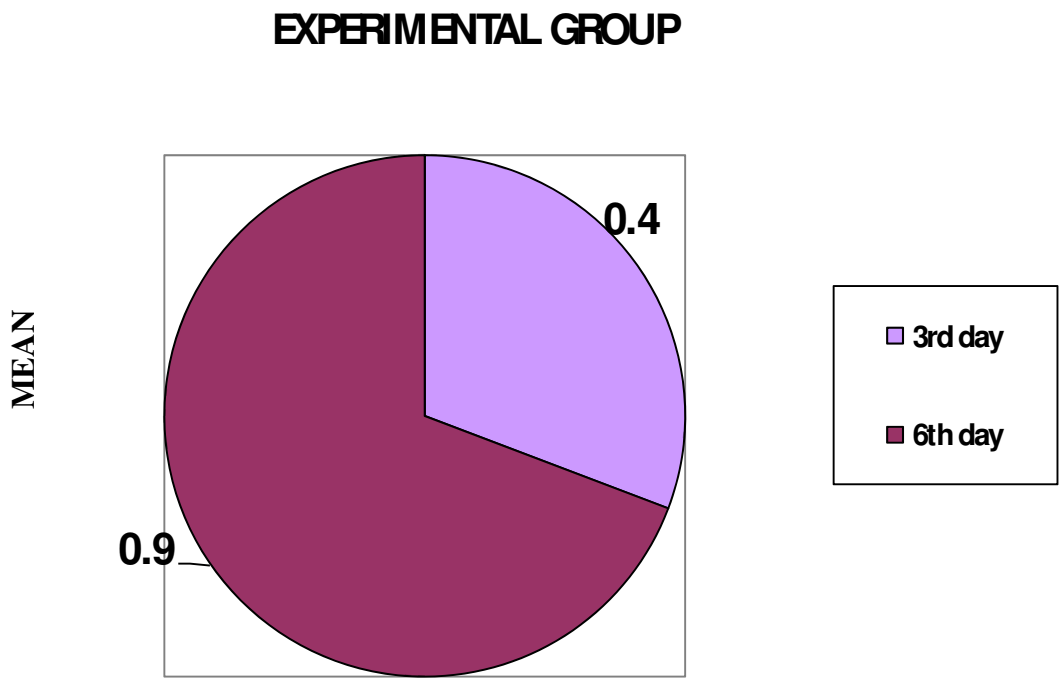

Figure 5: Comparison of mean central venous catheter infection score of the experimental group on the 3rd and 6th day

Table 4.

Comparison of mean central venous catheter site infection score of the control group on 3rd and 6th day.

N = 30

Level of infection	N	Mean	SD	't value'
3rd day	30	1.03	1.14	2.21 *
6th day	30	1.8	1.03	

* Significant at 0.05 level

In order to find out the difference between central venous catheter site infections assessment score between on the 3rd and 6th day of the control group, the null hypothesis was stated as follows:

Ho2 There will be no significant difference between the central venous catheter site infection assessment score on 3rd and 6th day of the control group

Table 4 which shows the mean central venous catheter site infection assessment score on the 3rd day (1.03) is lower than the central venous catheter site infection assessment score on the 6th day (1.8) .The obtained 't' value of 2.21 at degree of freedom 29 was significant at 0.05 level. This indicates that the difference between the mean is(.77) and it was the true difference and has not occurred by chance. So the researcher rejected the null hypothesis and accepted the research hypothesis.

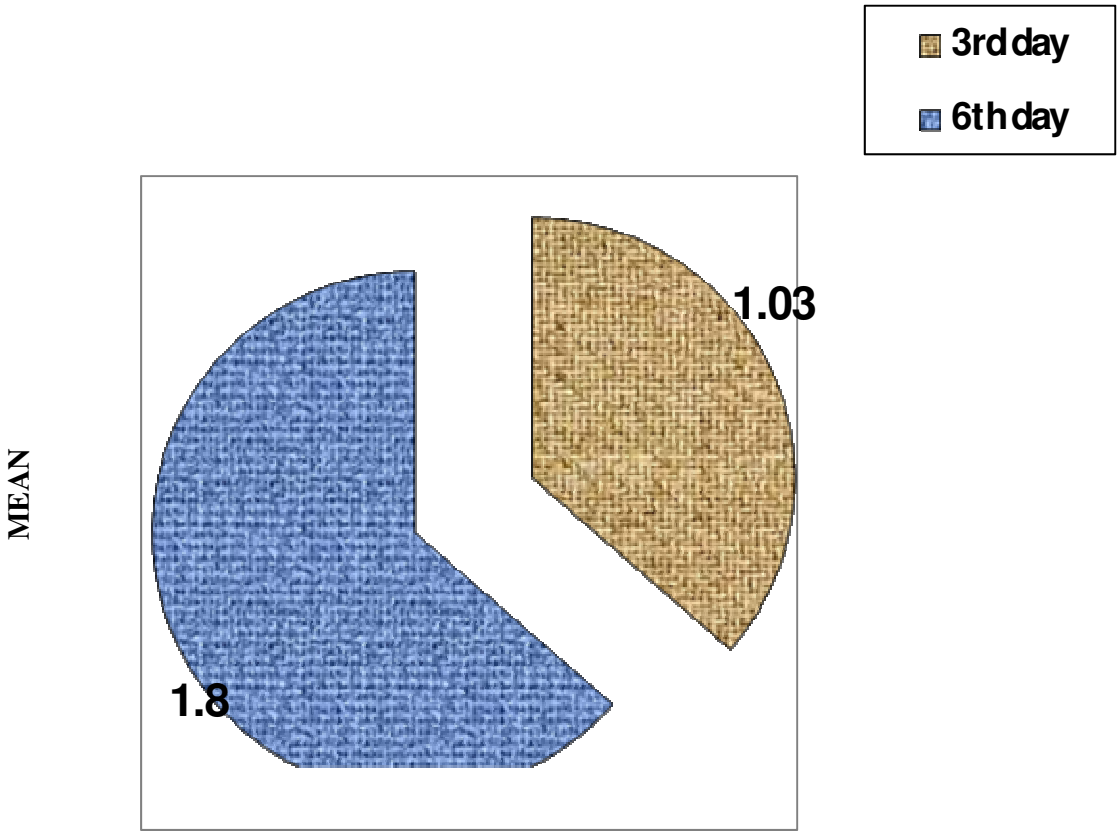

Figure 6: Comparison of mean central venous catheter site infection score of the control group on 3rd and 6th day.

Table 5

Comparison of mean central venous catheter infection scores of experimental and control group on 3rd day

N = 60

Group	N	Mean	SD	't value'
Experimental	30	0.4	.70	3 *
Control	30	1.03	1.14	

*Significant at 0.05 level

In order to find out the difference between central venous catheter site infection assessment score of experimental and control group on the 3rd day, the null hypothesis was stated as follows:

Ho3 the central venous catheter site infection assessment score of the experimental group on 3rd day will be significantly lower than the central venous catheter site infection assessment score of the control group

Table 5 shows that the mean central venous catheter site infection assessment score of experimental group on the 3rd day is (0.4) and it is lower than the central venous catheter site infection assessment score of the control group is (1.03) .The obtained 't' value of 3 at degree of freedom 58 (2) was significant at 0.05 level. This indicates that the difference between the mean is .63and it was the true difference and has not occurred by chance. So the researcher rejected the null hypothesis and accepted the research hypothesis.

The findings concluded that the central venous catheter site infection on the 3rd day was less in subjects who had transparent polyurethane dressing than routine

dressing

Table 6

Comparison of mean central venous catheter infection score of Experimental and control group on 6th day

N = 60

Group	N	Mean	SD	't value'
Experimental	30	0.9	.90	4.09*
Control	30	1.8	1.03	

* Significant at 0.05 level

In order to find out the difference between central venous catheter site infection assessment score of experimental and control group on the 6th day, the null hypothesis was stated as follows:

Ho4 the central venous catheter site infection assessment score of the experimental group on 6th day will not be significantly lower than the central venous catheter site infection assessment score of the control group on 6th day.

Table 6 shows the mean central venous catheter site infection assessment score of experimental group on the 6th day is (0.9) lower than the central venous catheter site infection assessment score of the control group is (1.8) .The obtained 't' value of 4.09 at degree of freedom 58(2) was significant at 0.05 level. This indicates that the difference between the mean is .9 and it was the true difference and has not occurred by chance. So the researcher rejected the null hypothesis and accepted the research hypothesis.

The findings concluded that the central venous catheter site infection on the 6th day was less in subjects who had transparent polyurethane dressing than routine dressing.

Table 7

Comparison of post mean central venous catheter infection scores of experimental and control group for 6 days

N = 60

Group	N	Mean	SD	't value'
Experimental	30	0.56	1.12	2.86*
Control	30	0.73	1.80	3.91*

* Significant at 0.05 level

In order to find out the difference between central venous catheter site infection assessment score of experimental and control group, the null hypothesis was stated as follows:

Ho5 The mean post assessment score of the central venous catheter site infection in the experimental group will not be significantly lower than the mean post assessment score of the central venous catheter site infection in the control group.

Table 6 shows that the mean central venous catheter site infection assessment score of experimental group is (0.56) and it is with SD (1.12) and the't' value was 2.86 was lower than the mean central venous catheter site infection assessment score (0.73) with SD (1.80) on the control group and't' value was 3.91, which is significant at 0.05 level. Since the obtained't' value is greater than the table value. So the researcher rejected the null hypothesis and accepted the research hypothesis.

The findings revealed that the transparent polyurethane (tegaderm) dressing of central venous catheter site infection was lower when compared to betadine dressing of central venous catheter site infection.

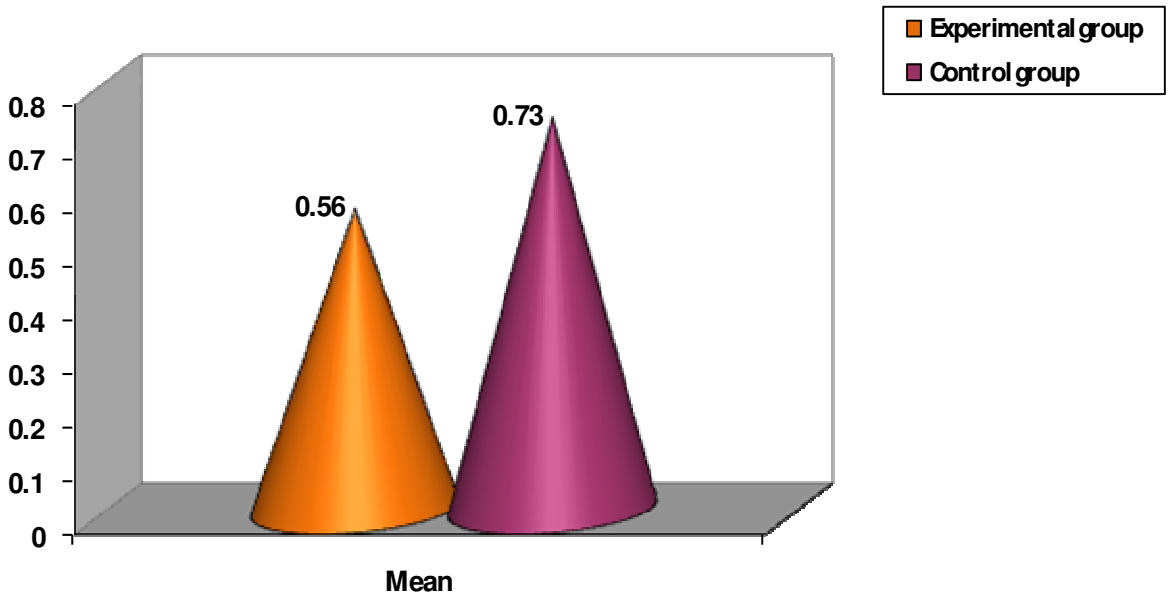

Figure7: Comparison of mean central venous catheter infection scores of experimental and control group

SECTION IV

Table 8

Comparison of cost effectiveness of transparent polyurethane dressing (tegaderm) and routine dressing among patient with central venous catheter

Variables	for One Application In Rs. /-	for 6 days Application In Rs. /-
Tegaderm	129.50	777
Betadine	80.50	483

In order to find out if there is any difference between the cost effectiveness of the patients who are using transparent polyurethane (tegaderm) and routine dressing on central venous catheter site.

Ho6 There will be no significant difference between in terms of cost who has received transparent polyurethane (tegaderm) and routine dressing over the central venous catheter site.

Table 8 shows the cost effectiveness of transparent polyurethane (tegaderm) and routine dressing. For one dressing application Rs .129.50 and for 6 days application cost is Rs.777 needed for transparent polyurethane (tegaderm). For one day betadine application is Rs. 80.50 and for up to 6 days application the cost is Rs .483.

The findings revealed that the transparent polyurethane (tegaderm) dressing is costly when comparing to routine dressing .The cost difference for one day application is Rs.40.

The findings revealed that the transparent polyurethane (tegaderm) dressing is

costly when compared to routine dressing

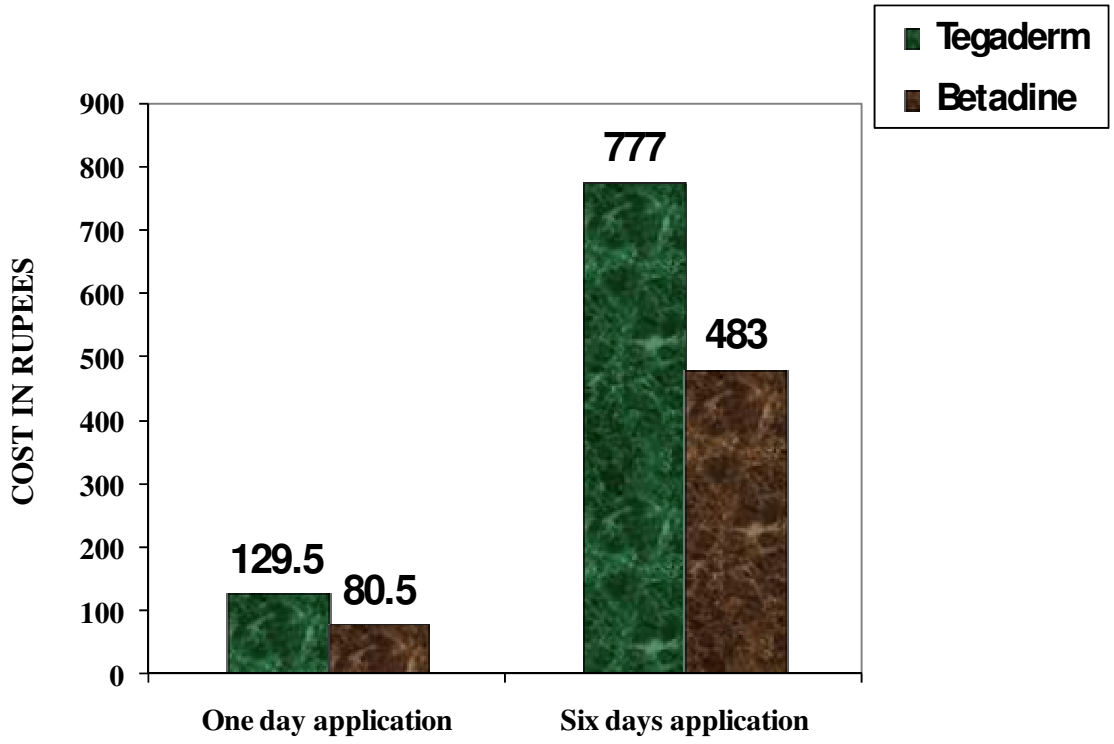

Figure 8: Comparison of cost effectiveness of transparent polyurethane dressing (tegaderm) and routine dressing among patient with central venous catheter.

CHAPTER V

DISCUSSION

The aim of the study was to assess the effectiveness of 2% chlorhexidine with transparent polyurethane (tegaderm) dressing on preventing infection and cost effectiveness among patient with central venous catheter. The experimental approach was used for the study. Purposive sampling technique was used to select the samples. A MR VICTOR TOOL (Multi Racial Visual Inspection Catheter Tool Observation Record) was used for data collection .After data collection, data was organised, tabulated, summarized and analysed. The study findings were discussed in this chapter with reference to the objectives of the study.

1. Demographic profile of the sample

As per the table no.1-shows that with regard to age, majority of clients 14(46.6%) in the experimental group belongs to the age group of 41 – 60 years, whereas 17 (56.6%) in the control group belongs to the age group of 41 – 60 years.

With regard to sex, in the experimental group 19 (63.3%) were males and 11(36.6%) were female's .In the control group, 20(66.6%) were males and 10(33.3%) were females.

With regard to marital status in the experimental group 25 (83.3%) of clients were married and 5(16.6%) were unmarried .In the control group, 26 (86.6%) were married and 4(13.3%) were unmarried.

With regard to site of the central venous catheter line, majority of the subjects in the experimental group 27 (90%) had internal jugular vein site and 3(10%) of clients had subclavian site. In the control group 29 (96.6%) had internal jugular vein site and 1(3.3%) of the clients had subclavian site.

With regard to the type of central venous catheter,4(13.3%) of clients had double lumen catheter and 26 (86.6%) of the clients had triple lumen catheter in the experimental group .In control group, 3(10%) of the clients had double lumen catheter and 27 (90%) of the clients had triple lumen catheter .

The above findings are supported by the study in Intensive care unit and related research regarding infectious risk associated with central venous catheters conducted in Europe. Jean –Christophe Lucet (2010), multicentre randomized two – by two factorial design used. The findings revealed that the patient with central venous catheter [n=171] under the mean of age 47-74 yrs, 62 clients had colonization (p=0.6), male clients 109 had colonization (p=.61). Site of catheter insertion was jugular catheter 67 clients and subclavian catheter 36 patients had colonization, p=<.001, double lumen 28 clients and triple lumen 153 clients had colonization, p=.059.

2. The first objective of the study was to assess the level of infection among patient with CVC after application of chlorhexidine 2% with transparent polyurethane (Tegaderm) and routine dressing on 3rd and 6th day.

As per the table no.-2 with regard to the day wise development of central venous catheter site infection of the experimental group majority of the subjects 21(70%) had no infection on 3rd day where as in control group only 13 (43.3%) had no infection. with regard to the 6th day assessment, in experimental group 11 (36.6%) had no infection, whereas in control group only 5(16.6%) had no infection.

Related to mild infection rate at central venous catheter site, in experimental group 8(26.6%) had mild infection on 3rd day and 11 (36.6%) had mild infection in control group. whereas after application interventions on 6th day 16 (53.3%) had mild infection in experimental group and 15 (50%) had mild infection in control group.

Moderate infection rate was found to be 1(3.3%) in experimental group on 3rd day, whereas control group had 6(20%). On the 6th day assessment only least 3 (10%) had moderate infection in experimental group, where as 10 (33.3%) had moderate infection in control group .None of the subjects in both the groups had severe infection. This difference in experimental and control group may be due to the effect of transparent polyurethane (tegaderm) dressing.

3. The second objective of the study was to assess the effectiveness of 2% chlorhexidine with transparent polyurethane (Tegaderm) application in terms of preventing infection among patient with CVC on experimental group on 3rd and 6th day.

Table no.-3 explains the findings with regard to the day wise development of central venous catheter site infection of the experimental group assessment score on the 3rd day (o.4) with standard deviation (.70) was lesser than the central venous catheter site infection assessment score on the 6th day (0.9) with standard deviation (.90) and the't' value was 2.83 at degree of freedom 29 was significant at 0.05 level.

The findings revealed that the central venous catheter site infection on the 3rd day was lower than the 6th day of 2% chlorhexidine with transparent polyurethane dressing among patients with central venous catheter.

The above findings were supported by the prospective randomized study conducted by Madeo, Martin and Nobbs (2008). He has done a study to find out the effect of transparent polyurethane dressing and sterile gauze dressing at peripheral intravenous catheter site. Transparent polyurethane was applied to 49 samples and 31 samples received sterile gauze dressing at intravenous catheter site. They have assessed the security of fixation, dressing condition, skin condition and rates of inflammation. The mean age of

patients were 63 years and the average length of cannulation was 18 hours. The finding showed that the only significant difference between the two groups was the dressing condition. The transparent polyurethane group was significantly better (P=0.006) than that of the gauze group.

4. The third objective of the study was to assess the effectiveness of routine dressing in terms of preventing infection among patient with CVC on control group on 3rd and 6th day.

As per the table no. - 4 findings shows that the mean central venous catheter site infection assessment score of the control group on the 3rd day (1.03) with standard deviation (1.14) was lower than the central venous catheter site infection assessment score on the 6th day (1.8) with standard deviation (1.03) and the 't' value of 2.21 at degree of freedom 29 was significant at 0.05 level.

The findings revealed that the central venous catheter site infection on the 3rd day was lower than the 6th day of routine betadine dressing among patients with central venous catheter.

The above findings were supported by randomized multicenter cross over trial study conducted by Frasca, Fizelier, Mimoz (2010) conducted a multicenter crossover trial compared the effectiveness of two pre-insertion cutaneous antisepsis protocols using aqueous 10% povidone-iodine or a solution of 5% povidone iodine in 70% ethanol . The incidences of catheter colonization (RR: 0.38 [95% CI: 0.22-0.65]) and catheter-related infection (RR: 0.34 [95% CI: 0.13-0.91]) were significantly lower in patients managed using the alcoholic povidone iodine solution protocol compared to the aqueous povidone iodine solution protocol. No significant effect was observed on bloodstream infections.

5. The fourth objective was to compare the post infection rate among CVC patient on experimental and control group in 3rd and 6th day.

Table no. -5 shows that the mean central venous catheter site infection assessment score of experimental group is (0.56) with SD (1.12) and the't' value was 2.86 was lower than the mean central venous catheter site infection assessment score (0.73) with SD (1.80) on the control group and 't' value was 3.91, which is significant at 0.05 level. The findings revealed that the transparent polyurethane (tegaderm) dressing of central venous catheter site infection rate was lower when compared to betadine dressing of central venous catheter site infection.

The above findings were supported by randomized study Frasca, Fizelier, Mimoz (2010) conducted a trial on comparison of chlorhexidine-based solution to 5% alcoholic povidone iodine. A total of 538 catheters were randomized and 481 (89.4%) produced evaluable culture results. Compared to alcoholic povidone iodine, the use of a chlorhexidine-based solution significantly reduced the incidence of catheter colonization by 50% (11.6% vs. 22.2% p = 0.002; incidence density, 9.7 vs. 18.3 per 1000 catheter-days). The use of the chlorhexidine-based solution was also associated with a trend towards the lower rates of catheter-related bloodstream infection (1.7% vs. 4.2% p = 0.09; incidence density, 1.4 vs. 3.4 per 1000 catheter-days). In this study, independent risk factors for catheter colonization were catheter insertion in the jugular vein (RR: 2.01 [95% CI: 1.24-3.24]) and use of alcoholic povidone iodine as skin disinfectant (RR: 1.87 [95 CI: 1.18-2.96]). He concluded that chlorhexidine-based solutions seem to be more effective than povidone iodine, even in an alcoholic formulation, and should be used as first-line antiseptics for CVC care.

6. The fifth objective of the study was to assess and to compare the cost effectiveness of transparent polyurethane dressing (Tegaderm) and routine dressing among patient with central venous catheter.

Table no.-8 shows that the cost effectiveness of transparent polyurethane (tegaderm) and routine dressing. For one dressing application Rs .129.50 and for 6 days application Rs.777 was needed for transparent polyurethane (tegaderm). For one day betadine application Rs. 80.50 and for up to 6 days application cost is Rs .483 was needed.

The findings revealed that the transparent polyurethane (tegaderm) dressing is costly when compared to routine dressing .The cost difference for one day application is Rs.40.

CHAPTER VI

Summary, Conclusion, Implication and Recommendation

This chapter includes the summary, conclusion and implication of the study in the field of nursing. It also presents the recommendations for the future research.

Summary of the study

The aim of the study was to evaluate the effectiveness of 2% chlorhexidine with transparent polyurethane (tegaderm) dressing on preventing infection and cost effectiveness among patient with central venous Catheter.

The following **objectives** were set for the study

1. To assess the level of infection among patient with Central Venous Catheter after application of chlorhexidine 2% with transparent polyurethane (Tegaderm) and routine dressing on 3rd and 6th day.
2. To assess the effectiveness of transparent polyurethane (Tegaderm) application in terms of preventing infection among patient with Central Venous Catheter on experimental group on 3rd and 6th day.
3. To assess the effectiveness of routine dressing in terms of preventing infection among patient with Central Venous Catheter on control group on 3rd and 6th day.
4. To compare the post infection rate among Central Venous Catheter patient on experimental and control group in 3rd and 6th day.
5. To compare the cost effectiveness of transparent polyurethane dressing (Tegaderm) and routine dressing among patient with Central Venous Catheter.

The following **hypotheses** were tested at 0.05 level of significance.

1. There will be significant difference between the Central Venous Catheter site infection assessment score on the 3rd and 6th day of the experimental group.

2. There will be significant difference between the Central Venous Catheter site infection assessment score on 3rd and 6th day of the control group.

3. The mean post infection assessment score of patient with Central Venous Catheter who had 2% chlorhexidine with transparent polyurethane (Tegaderm) dressing will be significantly lower than the mean infection assessment score of patient with Central Venous Catheter who had routine dressing on day 3 & 6th day.

4. There will be significant difference in terms of cost who has received Tegaderm and routine treatment over the Central Venous Catheter site.

The experimental research approach was used for the study .The design adopted was post –test only quasi experimental design. The study was conducted in Shenbagum hospital, Madurai which has 125 beds and 1 kilometre away from Sacred Heart Nursing College and Apollo hospital, Madurai which has 250 beds and ½ kilometres away from Sacred Heart Nursing College. Purposive sampling technique was used to select the samples. A total number of 60 samples were selected and among those 30 samples were treated with 2% chlorhexidine with transparent polyurethane (tegaderm) and 30 samples were treated with betadine dressing. A standardized MR VICTOR TOOL (Multi Racial Visual Inspection Catheter Tool Observation Record) grading system was used for data collection. Data collection procedure was used for a period of six weeks. After data collection, data was organized, tabulated, summarized and analyzed.

Major findings of the study

1. With regard to age, majority of clients 14(46.6%) in the experimental group belongs to the age group of 41 – 60 years, whereas 17 (56.6%) in the control group belongs to the age group of 41 – 60 years.

2. With regard to sex, in the experimental group 19 (63.3%) were males and 11(36.6%) were female's .In the control group, 20(66.6%) were males and 10(33.3%) were females.

3. With regard to marital status in the experimental group 25 (83.3%) of clients were married and 5(16.6%) were unmarried .In the control group, 26 (86.6%) were married and 4(13.3%) were unmarried.

4. With regard to site of the central venous catheter line, majority of the subjects in the experimental group 27 (90%) had internal jugular vein site and 3(10%) of the clients had subclavian site. In the control group 29 (96.6%) had internal jugular vein site and 1(3.3%) of the clients had subclavian site.

5. With regard to the type of central venous catheter, 4(13.3%) of the clients had double lumen catheter and 26 (86.6%) of the clients had triple lumen catheter in the experimental group .In control group, 3(10%) of the clients had double lumen catheter and 27 (90%) of the clients had triple lumen catheter.

6. Distribution of central venous catheter site infection among the experimental group and control group showed that the 1(3.3%) had moderate infection on 3rd day in experimental group where as in control group 6(20%) had the moderate infection. 3(10%) had moderate infection on 6th day in experimental group where as in control group 10(33.3%) had the moderate infection.

7. The mean central venous catheter site infection score of experimental group on 3rd day (0.4) was lower than the 6th day (0.9).

8. The mean central venous catheter site infection score of control group on 3rd day (1.03) was lower than the 6th day (1.8).

9. The mean central venous catheter site infection score of the experimental group on the 3rd day (0.4) was lower than the control group on the 3rd day (1.03).

10. The mean central venous catheter site infection score of the experimental group on the 6th day (0.9) was lower than the control group on the 6th day (1.8).

11. The mean central venous catheter site infection score of the experimental group (0.56) was lower than the control group (0.73).

12. The cost effectiveness of transparent polyurethane (tegaderm) for one application was Rs .129.50 and routine betadine dressing was Rs.80.50 .The tegaderm dressing was costly when compared to the betadine dressing.

Conclusion

1. Transparent polyurethane (tegaderm) dressing was to be effective in reducing the central venous catheter site infection among patient with central venous catheter.

2. There was a significant difference between the Central venous catheter site infection assessment score on the 3rd and 6th day of the transparent polyurethane (tegaderm) dressing

3. There was a significant difference between the Central venous catheter site infection assessment score on 3rd and 6th day of the routine betadine dressing.

4. The mean post central venous catheter infection assessment score of the experimental group was significantly lower than the control group after application of transparent polyurethane (tegaderm) and betadine dressing.

5. Tegaderm dressing was costly when compared to the betadine dressing.

Implications

The findings of the study have practical application in the field of nursing. The implication of the study could be discussed in four areas mainly nursing practice, nursing administration, nursing education and nursing research.

Implications for Nursing Practice:

The findings of the study will help the nurses in the following ways.

1. Early identification and prevention of the complication of central venous catheter site.
2. As 2 %chlorhexidine with transparent polyurethane (tegaderm) dressing is an expensive , and has minimal side effects , nurses can use for central venous

catheter care ,to prevent central venous catheter site infection of patient with central venous catheter.

3. Nurses can use easily MR VICTOR scale for early identification of the infection at central venous catheter site.
4. More nursing study can be conducted on central venous catheter site infection assessment in order to select proper cleaning solution.

Implications for Nursing Education:

1. This study enhances the nursing students to acquire knowledge, assessment of central venous catheter infection and prevention of central venous catheter infection.
2. This study enhances the student to think comprehensively in planning for the intervention in prevention of central venous catheter infection.
3. This study enables the students to compare the other possible ways of prevention of central venous catheter infection.
4. This study arouses motivation on the student to intelligibility care for the clients with central venous catheter.
5. The findings would help nursing faculty to give importance for using appropriate assessment and cleaning the central venous catheter site properly.

Implication for Nursing Research:

1. This study motivates for further studies related to this field.
2. This study will help the researcher to formulate new dressing methods to prevent central venous catheter infection.
3. This study can be a baseline for further studies to build upon.

Implication for Nursing Administration:

1. It helps to provide critical thinking regarding central venous catheter and its management.

2. The nurse advocate can arrange for continuing education programme for the nursing personnel to update their knowledge in assessing and care for patients with central venous catheter.

3. Standard protocol can be formulated for the prevention of central venous catheter infection by selecting appropriate cleansing agent at central venous catheter site.

4. The nurse administrator can bring a policy change regarding the central venous catheter care for prevention of central venous catheter infection

5. The nurse administrator can arrange seminars, conference and workshop to educate head nurses and staff nurses regarding the importance of central venous catheter care.

Limitations

1. The sample sizes in the experimental and in control group were 30. Hence the findings should be generalized with caution.
2. The patients were followed only for 6 days.
3. The frequency of dressing was once a day.

Recommendations

1. A similar study can be conducted on a large sample to generalize the study findings.
2. An explorative study can be done at various settings to identify factors influence the central venous catheter site infections.
3. Longitudinal study can be done to find out the occurrence of all central venous catheter site infection of patients with central venous catheter.
4. A study can be conducted to evaluate the knowledge and the attitude of nurses regarding central venous catheter site care.
5. A comparative study can be done to find the incidence of central venous catheter site infection among different types of central venous catheter.
6. Infection rate of central venous catheter site can be studied among various populations.
7. Comparative study can be done to find out the incidence of central venous catheter site infection among patients receiving chemotherapy with patients in other wards.

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APPENDIX –I

COPY OF LETTER SEEKING PERMISSION
TO CONDUCT THE STUDY IN SELECTED HOSPITALS, MADURAI

Dr. NALINI JEYAVANTH SANTHA
Principal.

4/235, COLLEGE ROAD
THASILDAR NAGAR
MADURAI – 625 020
PHONE: 2534593

Ref. UT: SHNC: 2010

Date: 01.06.2010

To

THE DIRECTOR ,

Respected Sir / Madam,

Sub: Sacred Heart Nursing College, Madurai – Project work of M. Sc (Nursing) student – permission requested – reg.

We wish to state that **Ms.Regila Jasmine**, Final year M. Sc (Nursing) student of our college has to conduct a Research project, which is to be submitted to The Tamilnadu Dr. M.G.R. Medical University, Chennai in partial fulfillment of University requirements.

The topic of research project is **"**A study to assess the effectiveness of chlorhexidine 2% with transparent polyurethane (tegaderm) dressing on preventing infection and cost effectiveness among patient with central venous catheter in selected Hospital at Madurai.

We therefore request you to kindly permit her to do the research work in your hospital under your valuable guidance and suggestions.

Thanking you,

Yours faithfully,

Principal
SACRED HEART NURSING COLLEGE

APPENDIX –II

Letter requesting options and suggestions of experts for establishing content validity and validity of tool

From

C.Regila Jasmine,
Msc (N) 2nd year,
Sacred Heart Nursing College,
Madurai.

To,

Respected Sir/Madam

SUB : Requesting and suggestion of experts for the content validity and validity of tool.

Iam a post graduate student (Medical SurgicalSpeciality) of The Sacred Heart Nursing College. I have selected the below mentioned topic of the research project submitted to DR.M.G.R. Medical university, Chennai as a fulfilment of Master of Science in nursing.

TITLE OF THE TOPIC:

"A study to assess the effectiveness of chlorhexidine 2% with transparent polyurethane (tegaderm) dressing on preventing infection and cost effectiveness among patient with central venous catheter in selected Hospital at Madurai"

With regard to this may I kindly request you to content and validate my tool for its relevancy. Iam enclosing the objectives of the study. I would be highly obliged and remain thankful for your great if you could validate and send it as early as possible.

Thanking you.

Place : Your's faithfully,

Date : (C.Regila Jasmine)

APPENDIX – III

List of Experts Consulted for the Content validity of Research Tools

Dr. P.Selvakumar , MD

Apollo hospital,

Madurai.

Dr.M.K.Giridhar Babu, MD

Government Rajaji Hospital,

Madurai.

Dr. Nalini Jeyavanth santha MSc (N),Ph.D (N)

Principal,

Sacred Heart Nursing College

Madurai.

Mrs.S. Poonguzhali MSc (N) MA

Principal

Madurai Medical College

Madurai.

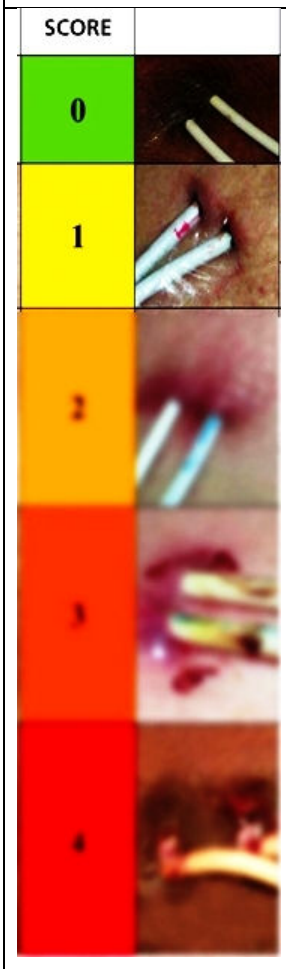
Mr.R. Senthil kumar Msc ,MPhil,PGDAS

Biostatistician

Madurai

APPENDIX – IV
MR VICTOR TOOL
(Multi Racial Visual Inspection Catheter Tool Observation Record)

To Score the patients CVC exit site the nurse needs to place the individual chart against the patients exit site. Comparing the images against the patient a score can then be allocated. Scoring is from 0-4, 0 being no signs of infection and 4 being severe of infection. When the score has been decided it is then recorded on the relevant record chart.

Scoring sheet	Signs / Symptoms	Day 3			Day 6		
		P	A	Interpretation	P	A	Interpretation
	No Fever, No discharge, Dry & Clean wound						
	Mild fever Mild serum discharge						
	Fever Pus wound (or) Serum Discharge						
	Catheter blockage Catheter tip culture positive,						

KEY WORDS :P=PRESENT A= ABSENT

DEMOGRAPHIC DATA

Information Related to Patient

1. Name	:	
2. Age (In years)	:	a) Below 20 b) 21 – 40 c) 41 – 60 d) 61 – 80
3. Gender	:	a) Male b) Female
4. Marital Status	:	a) Married b) Unmarried
5. Site of CVC Line	:	
6. Type of CVC Line	:	

APPENDIX - V

DRESSING PROCEDURE FOR CLEANSING CVC SITE

ARTICLES

A Sterile tray containing

S.NO	ARTICLES	PURPOSES
1	Gloves, mask	To prevent infection
2	Gauze pieces	To clean and dress the wound
3	Cleansing solutions Chlorhexidine (2%) Betadine solution (5%)	To clean the wound and the surrounding skin area
4	Small bowls	To take the cleansing solutions
5	Scissors	To cut the gauze pieces to fit around the wound
6	Artery forceps	To clean the wound
7	Dressing towel	To clean the wound and the surrounding skin area
8	Transparent polyurethane (tegaderm)	To apply on the central venous catheter site
9	Adhesive plaster	To fix the dressing in place
10	Kidney tray	To collect the waste
11	Mackintosh and towel	To protect the bed garments

PRELIMINARIES:

- Check the diagnosis and general condition of the patient.
- Check the condition of the CVC site, signs and exudates amount.
- Check the patient's name, bed number and other identification.
- Check the abilities and limitation of the patient
- Check the consciousness of the patient
- Check the articles available in the unit

PROCEDURE:

S.NO.	STEPS	RATIONALE
1	Tie the mask	To prevent wound contamination
2	Wash hands thoroughly for 15sec with liquid antimicrobial solution	To prevent cross infection
3	Put on clean gloves	To ensure asepsis
4	Carefully loosen and remove the old dressing. Peel the dressing toward the site without pulling on the CVC	To prevent contamination and to get ready for sterile dressing
5	Inspect the area around the site for any signs of infection by using MR VICTOR Tool.	To assess the wound infection status
6	Wash hands again for 15 sec with liquid antibacterial soap. Dry hands with towels	To prevent cross infection

7	Open the sterile dressing tray	To get ready to apply the dressing
8	Cleanse the area with solution for 30 sec and allow the area to dry for 30sec	To keep the wound clean
9	For experimental group: Clean the site with 2% chlorhexidine then application of transparent polyurethane (tegaderm) dressing. For Control group: Clean the CVC site with betadine solution .Then apply the gauze which is soaked in betadine solution.	It is a powerful, non irritating antiseptic solution. Tegaderm dressing helps to visualize the wound easily and protect the catheter site from external contamination. It is a microbial agent and helps in reduction of central venous catheter site infection. -
10	Remove the gloves and discard it	Gloves worn during the dressing adhesive plaster will be highly contaminated the CVC site
11	Secure the dressing with adhesive plaster.	-